



Snow Surveyors Climbing to a Snow Course

FEDERAL-STATE COOPERATIVE
SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for
MONTANA

MARCH 1, 1946

by

Montana Agricultural Experiment Station
and
Division of Irrigation, Soil Conservation Service
United States Department of Agriculture

in cooperation with

U. S. Forest Service
U. S. Geological Survey

U. S. National Park Service
State Engineer of Montana

Based on precipitation data, surface water conditions and on the water content of the snow cover on the higher watersheds of the principal drainage basins.

Temperatures during February were generally above normal except in the north eastern part of the state which was subjected to a number of cold periods with temperatures below normal according to reports by the U.S. Weather Bureau.

Precipitation at Bozeman during February was 1.13 inches, which was .42 inches above normal. It was the fourth consecutive month during which the precipitation was above normal. Bozeman is one of the few places in the state where the precipitation was above normal. Data for a number of representative stations are given in a table accompanying this report. These data were furnished by the U.S. Weather Bureau at Helena.

Soil moisture conditions are reported as good especially on summer fallow land. Reports from some parts of the state indicate that the soil is drying out rapidly on the surface.

Range conditions are reported as good, with rather dry conditions prevailing in the Beaverhead. The Big Hole Valley is covered with deep snow, and along the high line the range is covered with snow to such an extent as to interfere with the grazing of livestock. The south eastern part of the state has only a light snow cover and grazing is good.

Reports are available from the U.S. Geological Survey at Helena, which show the amount of water stored in reservoirs throughout the state. These data are given in 2 tables in this report. Figures available for 13 reservoirs west of the Continental Divide having a total storage capacity of 1,993,745 acre feet indicate that they are 46% full at the present time. A year ago they were 43% full.

East of the Continental Divide, data are available for 15 reservoirs having a combined storage capacity of 20,088,650 acre feet. These reservoirs were 65% full as of March 1. A year ago they contained 56% of their capacity. Thus the prospects are very good that they will be filled to capacity when the spring runoff occurs.

The snow cover as measured over the entire net work of snow courses ~~was~~ greater--with only one exception--than a year ago on the same date. Both the depth of snow and the water content are generally above the 5 year average. Hasty conclusions should not be drawn, however, from the present favorable conditions. The general trend of temperatures and precipitation should be observed closely, and it should be remembered that a reversal of the present above normal trend during the next 3 months could easily wipe out the accumulated above normal margin.

Summary of Snow Surveys by
Principal Watersheds
Missouri Basin

Gallatin - At 7 locations ranging in elevation from 6600 to 8100 the average water content was 10.6 inches as compared to 5.8 inches a year ago and a 5 year average of 7.5 inches. Assuming that normal conditions prevail the next 3 months, the outlook is 80% above last year and 40 more than the 5 year average.

Madison - At 3 locations representing average conditions on the Madison water shed the average snow depth was 46.3 inches and the water content 12.8 inches. This compares to a water content of 7.8 inches in 1945 and an average of 10.1 inches during the past 5 years. Thus the March 1, readings are 66% above last year and 26% above the 5 year average.

Jefferson - The average of 3 snow courses in the Jefferson water shed ranging in elevation from 7100 to 9450 feet showed a snow depth of 41 inches and a water content of 15.2 inches on March 1. Last year at the same date the water content was 7.7 inches at the same location. The 5 year average is 9.3 inches. Present moisture conditions are 97% above last year and 63% above the 5 year average.

Missouri River Main Stem - (Three Forks to Great Falls) Snow measurements were made on March 1, on 6 snow courses ranging in elevation from 6200 to 7950 feet. The average depth of snow was 30 inches and contained 8.4 inches of water. The water content on March 1, 1945 was 3.5 inches and the 5 year average 6.7 inches.

Sun River - Measurements made March 1, on a snow course on the North Fork of Sun River elevation 7000 feet showed a snow depth of 31.7 inches and a water content of 8.4 inches. A year ago the water content was 4.6 inches. The 5 year average is 5.8 inches. Thus present conditions are 82% above last year and 45% above the 5 year average.

Marias - The average on March 1, of two courses was a snow depth of 35.2 inches and a water content of 10.7 inches. The water content a year ago was 7.1 inches. The 5 year average is 7.5 inches. Thus the water content is 51% above last year and 43% above the 5 year average.

Musselshell - Measurements are made March 1, at 5 locations on the Musselshell water shed. At one of these the water content was less than a year ago, but the average water content for the 5 courses was 8.1 inches as compared to 5.2 inches last year and 6.52 inches for the 5 year average. Therefore the average water content was 56% above last year and 24% above the 5 year average.

Yellowstone - (above Livingston) Four snow surveys were made March 1, at which the average snow depth was 36 inches and the water content 8.7 inches. Last year the water content was 6.5 inches and the 5 year average is 7.8 inches. The water content on March 1, was 34% more than last year and 12% above the 5 year average.

Shields River - A survey at the Porcupine Ranger Station on March 1, showed a depth of 18.3 inches of snow. The water content was 4.8 inches as compared to 2.8 inches last year at the same date. The 5 year average is 3.22. The water content this year is 71% above last year and 49% more than the 5 year average.

Boulder River - No reports are available as of March 1, on the Boulder watershed. However measurements at Cooke City will apply to the Boulder. The water content at Cooke City was 6.4 inches as compared to 3.8 inches last year, and 5.5 for the past 5 year period.

Clarks Fork - The average snow depth on 2 snow courses was 25.6 inches with a water content of 5.5 inches. Measurements for 1945 are not available for comparison. The 5 year average is 5.5 inches.

Columbia Basin

Flathead River - Reports were received March 1, for surveys made on 4 snow courses representing average conditions on the Flathead watershed. The average snow depth was 69.8 inches and the average water content was 23.8 inches. Last year on the same date the average water content was 13.1 inches. The 5 year average for these 4 stations is 14.2 inches.

Bitter Root River - Surveys were made at 4 representative locations on the Bitter Root watershed on March 1. The average depth of snow observed was 58.5 inches. The water content was 18.5 inches. Last year on the same date the water content was 13.3 inches. The 5 year average is 13.0 inches.

Blackfoot River - Surveys made March 1, at 5 snow courses on the Blackfoot watershed showed an average depth of 24 inches of snow with a water content of 5.6 inches. A year ago the water content was 2.9 inches. The average for the past 5 years on March 1, has been 4.4 inches.

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

Precipitation and Departure from
Normal at a few representative
locations.

	Feb. 1946 Preci- pitation	Feb. 1946 Departure from Normal	Feb. 1945 Preci- pitation	Feb. 1945 Departure from Normal
<u>West of Divide</u>				
Butte	0.31	-0.11	0.13	-0.29
Deer Lodge	0.19	-0.24	0.26	-0.17
Hamilton	0.44	-0.31	0.55	-0.20
Columbia Falls	1.07	-0.24	*0.67	*-0.44
Missoula	0.34	-0.46	0.40	-0.41
<u>Central Division</u>				
Babb	0.50	-0.32	**1.60	**+0.34
Dillon	0.38	-0.34	0.77	
Fort Benton	0.05	-0.44	0.64	+0.15
Great Falls	0.12	-0.43	0.53	-0.02
Simpson	0.09	-0.15	***0.45	***-0.05
Helena WBO	0.21	-0.16	0.07	-0.30
Livingston	0.32	-0.22	0.30	-0.24
Lewistown A.P.	0.18	-0.59	0.52	-0.25
Red Lodge	0.66	-0.05	***0.98	****-0.10
<u>Eastern Division</u>				
Billings No. 2	0.16	-0.34	0.43	-0.07
Circle	0.12	-0.49	0.02	-0.59
Fort Peck	0.15	-0.12	0.27	0.00
Frazer	0.58	+0.24	0.51	+0.17
Mildred	0.23	-0.03	****0.05	*****-0.15
Brusett	0.27		0.12	
Medicine Lake	0.65	+0.33	0.27	-0.05
Garland	0.18	0.22		
Miles City			0.08	-0.41

* Kalispell

**Sherburne Lake

*** Havre

**** Mystic Lake

***** Paxton

WATER STORED IN RESERVOIRS
IN MONTANA

Missouri - Yellowstone Basin

March 1, 1946

(Data furnished by operating organizations;

Compiled by Water Resources Branch, U.S. Geological Survey, Helena, Mont.)

Reservoir	Location	Usable Capacity Acre Feet	Contents this month Acre Ft.	Contents a Yr. ago Acre Ft.
1. Lake Scwall	Missouri R.	37800	35840	36980
2. Ft. Peck	Missouri R.	19000000	12520000	10720000
3. Ruby	Ruby R.	38850	35980	28300
4. Hebgen	Madison R.	345000	209500	217700
5. Madison	Madison R.	41000	37970	35500
6. Gibson	N. Fk. Sun R.	105000	64180	59210
7. Willow Creek	N. Fk. Sun R.	32300	10870	21540
8. Pishkun	N. Fk. Sun R.	32000	22780	17230
9. Four Horns	Badger Cr.	20000	5500	5300
10. Birch Cr.	Birch Cr.	30000	20610	22360
11. Lake Francis	Birch Cr.	112000	95420	98380
12. Fresno	Milk R.	127200	50440	41530
13. Sherburne	Swift Current	66100	20200	21300
14. Cooney				
15. Tongue R.	Tongue R.	73900	10460*	6300
		20088650	13143750	11340630

*Contents last month - No report for March 1

65%

56%

WATER STORED IN RESERVOIRS IN MONTANA

Columbia Basin

March 1, 1946

(Data furnished by operating organizations;

Compiled by Water Resources Branch, U.S. Geological Survey, Helena, Mont.)

Reservoir	Location	Usable Capacity Acre Feet	Contents this month Acre Ft.	Contents a Yr ago Acre Ft.
1. Georgetown Lake	Flint Cr.	31000	23220	17200
2. Little Bitter Root Lt.	Bitter R.	18000		
3. Hubbart Reservoir	Lt. Bitter R.	12100	1100*	1860
4. West Fk. Bitter Root	W.Fk. B.R.	31700	10000	10000
5. Nevada Cr.	Nevada Cr.	12600	6720	2100
6. Pablo Canals	Mission Valley	25000	3660*	8180
7. Lower Crow	Crow Creek	10350	6030*	8430
8. Kicking Horse Res.	Mission Valley	8350	3510*	3260
9. Ninepipe Res.	Mission Valley	14870	8360*	5910
10. McDonald Res.	Post Creek	8225	5710*	3770
11. Mission Res.	Mission Creek	7250	3390*	4470
12. Tabor Res.	Dry Creek	23300	3950*	2960
13. Flathead Lake	Flathead R.	1791000	851000	792,000
		1993745	926650	858,040

* Contents last month - No report for March 1

46%

43%

MONTANA COOPERATIVE SNOW SURVEYS

March 1, 1946

Missouri Basin

Name of Snow Course	Local watershed	Elev. of Snow Course	1946 Measurements Date	Water ponding Dates							Corres- 5 Yr. Av.	1946 W.C. compared to	
				Snow Depth	1941	1942	1943	1944	1945	1945 %		5 Yr. %	Av.
:													
<u>Gallatin</u>													
Mystic Lake #1	Boreman Cr.	6600	: 3-4 :	32.2:	8.1:	4.2:	7.5:	6.7:	4.8:	4.2:	5.5 :	193 :	147 :
Mystic Lake #2	" "	6600	: :	:	:	:	:	:	:	:	:	:	:
New World	" "	6600	: 3-4 :	38 ;10.8:	4.8:	7.9:	:	7.2:	5.5:	6.3 :	196 :	171 :	:
Ross Peak	Spring Cr.	7000	: 3-2 :	30.2:	8.1:	3.9:	8.5:	5.9:	3.7:	4.5:	5.3 :	180 :	153 :
Hood Meadow Ext.	Middle Cr.	6600	: 3-2 :	30.0:	7.7:	4.3:	7.5:	8.1:	5.9:	4.2:	6.0 :	183 :	128 :
Devil's Slide	" "	8100	: 3-1 :	61.0:	18.7:	9.2:	17.1:	17.6:	10.8:	10.9:	13.1 :	171 :	143 :
21 Mile	Gal-Madison	7150	:2-28 :	51.6:	14.8:	9.5:	11.1:	21.0:	9.1:	8.6:	11.9 :	172 :	124 :
*320 Ranch	Gallatin	6600	: 3-1:	:	5.7:	4.7:	5.0:	7.2:	4.2:	3.1:	4.8 :	184 :	119 :
:													
<u>Madison</u>													
Norris	Gibbon	7500	No Measurement	:	5.4:	6.2:	15.3:	6.6:	7.3:	:	:	:	:
West Yellowstone	Madison	6700	:2-28 :	39.3:	10.6:	7.5:	9.0:	17.9:	6.1:	6.7:	9.4 :	158 :	113 :
Hebgen	"	6500	:2-28 :	48.0:	13.0:	8.6:	8.2:	13.7:	6.5:	7.9:	9.0 :	164 :	144 :
21 Mile	Gal-Madison	7150	:2-28 :	51.6:	14.8:	9.5:	11.1:	21.0:	9.1:	8.6:	11.9 :	172 :	124 :
:													
<u>Jefferson</u>													
Gibbons Pass	Gibbon	7100	:2-28 :	71.2:	22.9:	13.3:	18.0:	30.6:	10.2:	15.6:	17.5 :	147 :	131 :
Elkhorn	Beaverhead	9450	:2-28 :	36.6:	8.9:	4.7:	6.8:	13.8:	3.3:	4.9:	6.8 :	182 :	131 :
Pipestone Pass		7200	:3-2 :	16.0:	3.9:	2.0:	4.8:	6.0:	2.8:	2.6:	3.6 :	150 :	108 :
* Accumulated since October 1													

MONTANA COOPERATIVE SNOW SURVEYS

March 1, 1946

Missouri Basin

Name of Snow Course	Local Water-shed	Elev. of Snow Course	1946 Measurements Date	Snow Depth	Water Content	Water Dates	5 yr. period	1941	1942	1943	1944	1945	5 yr. Av.	1946 W.C. compared to 1945 %	5 yr. Av.
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Missouri Main Stem

Rimini	Lower Ten Mile Cr.	6250	2-28	20.8	4.9	2.6	6.9	7.3	3.4	3.4	4.7	144	104
Rimini	Middle Creek	6800	3-1	30.2	7.7	3.9	9.4	10.6	5.1	5.6	6.9	137	111
Rimini	Upper Creek	8000	3-1	36.4	10.8	5.8	11.9	15.0	6.9	7.4	9.4	146	115
Chesman	Upper Creek	6200	3-4	13.2	3.3	1.7	4.2	7.4	1.9	1.1	3.2	270	94
Stemple Pass-Lt.	Prickly Pear	6900	3-4	32.5	8.2	3.8	5.6	13.0	3.0	6.8	6.4	120	128
Kings Hill	Belt Creek	7950	2-26	45.8	15.8	6.4	10.1	14.0	7.2	8.8	9.3	180	170

1
Sun River
Goat Mt.

No. Fork	7000	3-2	31.7	8.4	2.6	3.9	15.4	2.9	4.6	5.8	182	145
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2
Marias
Marias Pass
Rocky Boy

Two	5250	2-27	47.6	15.8	7.3	6.7	19.4	7.2	9.6	10.0	165	158
Medicine	5250	2-28	22.8	5.5	5.6	5.0	4.5	5.0	110			

Misselshell

4
Orville Harris
Grasshopper
Half Moon
Crystal Lake
Kings Hill

No. Fork	6540	2-27	16.0	3.2	2.5	4.9	6.4	5.1	3.8	3.85	84	83
4 Mile	7000	3-1	16.3	3.6	3.0	4.8	5.7	1.4	3.5	3.69	103	97
Ross Fork	6000	3-1	23.8	6.5	5.6	10.2	7.8	4.5	3.7	6.38	175	101
Flat Willow	5500	3-2	38.1	11.5	8.0	13.5	9.9	9.3	6.3	9.4	183	122
Belt	7950	2-26	45.8	15.8	6.4	10.1	14.0	7.2	8.8	9.3	180	170

MONTANA COOPERATIVE SNOW SURVEYS

March 1, 1946

Yellowstone Basin

Name of Snow Course	Local Water-shed	Elev. of Snow Course	1946 Measurements Date	Snow Depth	Water Content	Water Content on Corresponding Dates 5 yr. period					5 yr. Av.	1946 W.C. compared to		5 yr. Av.
						1941	1942	1943	1944	1945		1945 %	%	
<u>Yellowstone</u>														
<u>Main Stem</u>														
Lake	Yellowstone	7850	: 3-4	: 36.8	: 8.5	: 5.65	: 6.69	: 18	: 6.1	: 6.8	: 8.65	: 125	:	99
Canyon	Yellowstone	7750	: 3-1	: 39.7	: 10.3	: 5.5	: 6.56	: 16.7	: 5.8	: 7.1	: 8.33	: 145	:	124
Norris-Madison	Gibbon	7550	No Report			: 5.4	: 6.22	: 15.3	: 6.6	: 7.3	: 8.16	:	:	
Crevice #1	Gardiner	8400	: 2-28	: 34.5	: 8.5	: 5.1	: 5.5	: 14.25	: 4.9	: 5.9	: 7.13	: 144	:	119
Crevice #2	Gardiner	8400	: 2-28	: 33.3	: 7.7	: 4.3	: 5.4	: 14.3	: 4.7	: 6.2	: 6.98	: 124	:	110
<u>Shields River</u>														
Porcupine	Shields R.	6500	: 2-28	: 18.3	: 4.8	: 2.2	: 4.8	: 4.5	: 1.8	: 2.8	: 3.22	: 171	:	149
<u>Boulder</u>														
Independence	Boulder	8000	No Report			: 6.6	:	: 24.3	: 9.7	: 9.7	: 10.06	:	:	
Hell's Canyon	"	6000	No Report			: 1.5	: 3.3	: 4.3	: 2.9	: 4.2	: 3.24	:	:	
<u>Clark's Fork</u>														
Cooke City	Soda Butte	7400	: 3-4	: 30.5	: 6.4	: 3.4	: 5.2	: 12.8	: 2.1	: 3.8	: 5.46	: 168	:	118
Camp Senia	Rock Cr.	7870	: 2-28	: 20.7	: 4.7	: 1.7	: 5.85	: 9.6	: 5.8	:	: 5.74	:	:	

MONTANA COOPERATIVE SNOW SURVEYS

Columbia Basin

March 1, 1946

Name of Snow Course	Local Water-shed	Elev. of Snow Course	1946 Date	Measurements Snow Depth	Water Content	Water Dates	5 Yr. Period	1941	1942	1943	1944	1945	5 Yr. Av.	1946 compared to 1945 %	W.C. 5 Yr. Av. %
<u>Flathead River</u>															
Big Creek	Hellroaring	6750	:	:	:	:	23.7	24.8	36.4	23.7	29.7	27.6	:	:	:
Elk Mountain	Flathead	6750	:	:	:	:	12.8	13.8	21.3	12.6	19.5	16.0	:	:	:
Goat Mountain	Sun River	7000	:	3-2	31.7	8.4	2.6	3.9	15.4	2.9	4.6	5.9	182	:	142
N. Fork Jocko	Jocko R.	6330	:	:	:	:	23.2	21.7	41.2	20.1	32.6	27.8	:	:	:
Stuart Mt.	Misscula	7400	:	3-1	91	33.4	16.2	18.0	33.2	12.2	19.8	19.9	169	:	168
Lookout	St. Regis	5250	:	3-1	109	37.5	18.6	14.9	37.1	17.0	18.4	21.2	204	:	177
Marias Pass	Marias	5250	:	2-27	47.6	15.8	7.3	6.7	19.4	7.2	9.6	10.0	165	:	158
<u>Bitter Root River</u>															
Gibbons Pass	Big Hole	7100	:	2-28	71.2	22.9	13.8	18.0	30.6	10.2	15.6	17.6	147	:	130
Nez Perce Camp	Bitter Root	5580	:	3-2	45	13.8	5.7	5.7	7.4	6.7	9.1	6.9	152	:	200
Nez Perce Pass	Bitter Root	6575	:	3-2	55	17.5	6.6	9.2	27.2	8.7	13.6	13.1	129	:	133
Packers Meadow	Clearwater	5700	:	2-28	63	19.8	10.1	8.6	28.1	10.1	15.0	14.4	132	:	138
<u>Blackfoot River</u>															
Stemple Pass	Prickly Pear	6900	:	3-4	32.5	8.2	3.8	5.6	13.0	3.0	6.8	6.4	120	:	128
Intergaard	Rock Creek	6450	:	2-8	28	5.9	3.6	7.0	7.4	2.9	2.4	4.7	246	:	125
Stuart Mill	Rock Creek	6500	:	2-8	24	5.4	2.8	5.4	6.9	2.3	1.4	3.8	386	:	142
Southern Cross	Rock Creek	6500	:	2-8	21	4.8	2.8	5.0	5.2	2.8	1.5	3.5	320	:	137
Pipestone Pass	Jefferson	7200	:	3-2	16	3.9	2.0	4.8	6.0	2.8	2.6	3.6	150	:	108

